or even lessened by lengthening the working day. The author does not take into consideration, however, the view, now becoming recognised, that a worker with a long day before him tends, consciously or unconsciously, to conserve his energy and to distribute it uniformly throughout the day. It is not improbable, indeed, that the ill-effects of unduly long working hours may be not so much the direct result of a greater expenditure of energy as the indirect result of shortening of the time available for leisure and recreation.

NOTES.

LONG lists of New Year honours—mostly conferred for services rendered in connection with military or naval operations—were published on Monday. We notice in these lists the following names and distinctions:—*K.C.S.I.:* Sir Francis E. Younghusband, the distinguished traveller and geographer; Maj.-Gen. R. C. O. Stuart, Director-General of Ordnance in India. *C.I.E.:* S. M. Burrows, secretary to the Oxford Delegacy for Oriental Students; P. J. Hartog, lately secretary to departmental committees on the organisation of Oriental Studies in London. *Kaisar-i-Hind Medal for Public Services in India, First Class:* Sir F. A. Nicholson, Honorary Director of Fisheries, Madras; and Dr. H. H. Mann, principal, Agricultural College, Poona, and agricultural chemist, Bombay. The following medical men are among those on whom honours are conferred for services in the field:—*K.C.B.:* Surgeon-General H. R. Whitehead. *C.B.:* Col. J. M. Irwin, Col. R. L. R. Macleod, Col. G. Cree, Col. A. A. Sutton, Col. G. H. Barefoot, Temp.-Col. T. Sinclair, Lieut.-Col. E. T. F. Birrell. *K.C.M.G.:* Col. M. P. C. Holt. *C.M.G.:* Col. T. Daly, Col. W. L. Gray, Col. F. R. Newland, Col. H. T. Knaggs, Col. H. I. Pocock, Col. B. H. Scott, Col. R. W. Wright, Col. T. Du Bedal Whaite, Col. F. J. Morgan, Temp.-Col. T. C. English, Lieut.-Col. A. R. Aldridge, Lieut.-Col. J. D. Ferguson, Lieut.-Col. F. H. Withers, Lieut.-Col. F. R. Buswell, Lieut.-Col. L. F. Smith, Lieut.-Col. F. A. Symons, Temp.-Lieut.-Col. G. M. Holmes, Temp.-Lieut.-Col. H. L. Eason.

WHEN the Germans introduced the use of poisonous gases into warfare, immediate steps were taken by our military authorities to provide the troops with means of protection from them, and action was taken later to organise offensive as well as defensive measures. The matter was put into the hands of leading chemists, physicists, and physiologists, with the result that our gas attacks are now more effective than those of our enemies. Field-Marshal Sir Douglas Haig, Commanding-in-Chief the British Forces in France, makes the following reference to this subject in his despatch dated December 23, 1916:—"The employment by the enemy of gas and of liquid flame as weapons of offence compelled us not only to discover ways to protect our troops from their effects, but also to devise means to make use of the same instruments of destruction. Great fertility of invention has been shown, and very great credit is due to the special *personnel* employed for the rapidity and success with which these new arms have been developed and perfected, and for the very great devotion to duty they have displayed in a difficult and dangerous service. The Army owes its thanks to the chemists, physiologists, and physicists of the highest rank who devoted their energies to enabling us to surpass the enemy in the use of a means of warfare which took the civilised world by surprise. Our own experience of the numerous experiments and trials necessary before gas and flame could be used, of the great preparations which had to be made for their manufacture, and of the special training required for the *personnel* employed, shows that the employment of such methods by the Germans was not the result of a desperate decision, but had been prepared for deliberately. Since we have been compelled, in self-defence, to use similar methods, it is satisfactory to be able to record, on the evidence of prisoners, of documents captured, and of our own observation, that the enemy has suffered heavy casualties from our gas attacks, while the means of protection adopted by us have proved thoroughly effective."

THE Canadian Government has appointed an honorary advisory council on scientific and industrial research to advise a committee of the Cabinet on all matters relating to scientific and industrial research, with the view of securing the united efforts of scientific workers and industrial concerns, and of selecting the most pressing problems indicated by industrial necessities to be submitted to research institutions and individuals for solution. We learn from *Science* that the members of this advisory council are:—Dr. A. S. Mackenzie, president of Dalhousie University, Halifax, N.S.; Dr. F. D. Adams, dean of the faculty of applied science, McGill University; Dr. R. F. Ruttan, professor of chemistry, McGill University; Dr. J. C. McLennan, director of the Physical Laboratories, University of Toronto; Dr. A. B. Macallum, president of the Royal Society of Canada, University of Toronto; Dr. W. Murray, president of the University of Saskatchewan, Saskatoon; Mr. R. Hobson, president of the Steel Company of Canada, Hamilton, Ont.; Mr. R. G. Ross, consulting electrical engineer, Montreal; and M. Tancrède Bienvenu, manager of La Banque Provinciale, Montreal. The question of co-operation between the scientific men of the country and industrial concerns with the view of solving the problems raised by the war and of placing the industrial resources of the country in a position to meet the conditions that will arise after the war has been under consideration by the Government and by representatives of science and industry for some time, as it was felt to be desirable to follow the example of the British Government in this matter. In a memorandum Sir George E. Foster, Minister of Trade and Commerce, has pointed out "the urgent need of organising, mobilising, and economising the existing resources of scientific and industrial research in Canada with the purpose of utilising waste products, discovering new processes—mechanical, chemical, and metallurgical—and developing into useful adjuncts to industry and commerce the unused natural resources of Canada."

METEOROLOGY has lost one of its most ardent supporters by the sudden death of Mr. William Marriott at Dulwich on December 28. He was sixty-eight years of age, and throughout his life had been remarkably free from illness, but latterly heart trouble had developed. Mr. Marriott commenced his meteorological work at Greenwich Observatory in January, 1869, and he left the observatory at the end of 1871. Whilst at the Royal Observatory he was in the magnetic and meteorological department under Mr. James Glaisher, F.R.S., who was very actively associated with the Meteorological Society. Mr. Marriott became assistant-secretary to the Meteorological Society in 1872, and he maintained the position until his retirement in September, 1915, after forty-three years' service. He had become a member of the society whilst serving at Greenwich, in 1870. The science of meteorology has steadily developed during the last half-century, and Mr. Marriott, in his official capacity, took the keenest interest in furthering its advancement. From 1881 to 1911 he edited the *Meteorological Record,* which contained the monthly results of meteorological observations over England and Wales. For climatological questions the *Meteorological Record* has afforded material of great value. Since 1911 this work has been taken over by the Meteorological Office. Mr. Marriott was the author of "Hints to Meteorological Observers," a work which constitutes instructions for taking observations, also "Some Facts about the Weather." He was a frequent writer for the Quarterly Journal of the Royal Meteorological Society, his contributions dealing with many and very varied subjects.

Lieut.-Col. Sir Frederic S. Eve, who died on December 15, in his sixty-third year, was at one time senior surgeon to the London Hospital. In the earlier part of his career, while acting as curator of the museum of St. Bartholomew's Hospital and pathological curator to the museum of the Royal College of Surgeons of England, he investigated certain obscure forms of tumour which are apt to occur in the jaws, and cleared up their nature. He published several investigations on tuberculosis and other diseases of bones and joints. In 1915 he gave the Bradshaw lecture at the Royal College of Surgeons on "Hæmorrhagic and Chronic Inflammation of the Pancreas."

On November 27 the Finnish entomologist, Dr. B. R. Poppius, died at Copenhagen, where he was acting upon the Norvego-Swedish Committee on the Grazing-grounds of Reindeer. He was only forty years old.

The death is announced, in his eightieth year, of Dr. J. Little, Regius Professor of physic, Dublin University, and a past-president of the Royal College of Physicians, Ireland, and of the Royal Academy of Medicine, Ireland.

The Royal Swedish Academy of Science has elected as foreign members Sir William Crookes, O.M., Dr. C. A. Angot, director of the Bureau Central Météorologique de France, and Prof. August Gärtner, professor of hygiene, University of Jena.

It is announced that the Welsh National Museum Committee has received a gift of 20,000*l.* from anonymous donors, and that this will enable the committee to complete the building contract.

Capt. Charles Bathurst, M.P., has, on becoming Parliamentary Secretary to the Ministry of Food, relinquished the post of organiser of the Land Settlement Scheme for ex-Service Men which he has held under the Board of Agriculture and Fisheries in an honorary capacity for the last eight months. The duties have been taken over by Sir Richard Winfrey, M.P., Parliamentary Secretary to the Board of Agriculture and Fisheries.

The Massachusetts Horticultural Society has awarded its George Robert White medal to Mr. W. Robinson, of Gravetye Manor, Sussex, for his eminent services in the advancement of horticulture.

It is announced in the issue of *Science* for December 15 last that a bequest of more than 20,000*l.* has been left to the American Museum of Natural History by the late Mr. James Gaunt, American representative of Messrs. A. and F. Pears, of London. The bequests are to be paid upon the death of Mr. Gaunt's brother.

The Optical Society has arranged an exhibition of workshop methods of optical testing to be held at King's College, Strand, on Thursday, January 11, from 5 to 9.30 p.m.

The Alvarenga prize of the College of Physicians of Philadelphia will be next awarded on July 14 of this year. It will be of the value of about 50*l.* Competing papers may deal with any medical subject, but they must not have been already published. They must reach the secretary of the college on or before May 1. Further particulars are obtainable from Dr. F. R. Packard, 19 South 22nd Street, Philadelphia, Pa., U.S.A.

A meteor of unusual brilliance is reported to have been seen at Churchstoke, in Montgomeryshire, about 5.30 p.m. on December 19 last. It crossed the sky from south to north, and is said to have been "accompanied by a slight explosion." Many people were alarmed by the brilliance of the object, which lighted up the whole countryside.

The report of the council of the Scottish Meteorological Society, read at the general meeting of the society on December 15, states that the encouragement of rainfall observation in Scotland has been kept steadily in view, and that there are now available in the journal monthly and annual returns for fully 750 stations. There are still, however, large areas in the North of Scotland for which information is either extremely scanty or entirely wanting. The officers and members of the council for the ensuing twelve months will be as follows:—*President,* Prof. R. A. Sampson; *Vice-Presidents,* Dr. A. Crichton Mitchell and Mr. M. M'Callum Fairgrieve; *Council,* Mr. J. Watt, Sir R. P. Wright, Prof. T. Hudson Beare, Dr. J. D. Falconer, Mr. J. Mackay Bernard, Mr. D. A. Stevenson, Mr. R. Cross, Mr. S. B. Hog, and Mr. G. Thomson; *Hon. Secretary,* Dr. E. M. Wedderburn; *Hon. Treasurer,* Mr. W. B Wilson.

The American Forestry Association has called a conference, to be held at Washington on January 18–19, to discuss measures for saving the white pine forests of North America from being destroyed by the blister rust. The Governors of all the States in the white pine belt, and the Government of Canada, are invited to appoint delegates. The disease came from Germany in 1907, when the Forestry Bureaux of several States imported thousands of seedlings and transplants from the nurseries of that country. That they were thus affected was not discovered until many of the trees had been set out, and only during the last year did the disease attain dangerous proportions. The blister rust is described as a fungous growth, which lives one year in the white pine and the next in currant and gooseberry plants. It cannot spread from pine to pine, but travels from pine to ribes and from ribes to pine. In the ribes it appears in the form of raised reddish-brown patches on the under-side of the leaves. In the pine it is more difficult to recognise, and can only be discovered by a scientific expert during the "fruiting period" in the spring, when the base of small trees just above the ground shows a yellowish growth of fungus and is often itself swollen. At present the only effective method of saving the pines that has been suggested is to root out all ribes in the neighbourhood of the forests—a costly remedy in some parts of New York State, where the farmers raise large crops of currants and gooseberries. Mr. G. D. Pratt, the New York State Conservation Commissioner, has announced that no more white pines will be seeded until it has been found what can be done.

In the *American Museum Journal* for November Mr. M. D. C. Crawford discusses the value of design and colour in ancient fabrics to the manufacturer of our day. The Philadelphia Museum has recently obtained a collection of textiles from Peruvian graves which are believed to antedate the Spanish Conquest by some 2000 years. They are said to contain some of the most wonderful colour combinations in any fabrics hitherto known. Compared with them, we are told, "the Coptic fabrics represent a very limited development, and even the interesting cloths recently excavated in Turkestan by Sir Aurel Stein are but a fragmentary record of the art they represent. In Peru every process of decoration of which we know is found, every trick of the weaver's art, every skilful blending of colours. Nor is this a record of scattered fragments. Even the rarer techniques are well represented, and there is enough material to furnish inspiration for a century of design." The article contains good photographic reproductions of these interesting fabrics.

DR. W. E. ROTH contributes to the thirtieth annual report of the Bureau of American Ethnology a comprehensive paper on the animism and folklore of the Guiana Indians, of which the best hitherto known accounts are those of Brett, im Thurn, and Wallace. He finds no evidence of a belief in a Supreme Being, but the Spirits of the Bush are held in great respect. He describes a remarkable Carib String Puzzle, designed to deceive these Bush Spirits, the object being to remove, without cutting or breaking, an endless string from two sticks upon which it has been placed. If an Indian loses his way in the forest, the Spirit is the cause. So he leaves this puzzle on a pathway, and the Spirit, passing by, sees it, starts examining it, and tries to get the string off. So engrossed does he become that he forgets all about the wanderer, who is now free to find the road again. Brett describes an analogous case of a boy on the Lower Amazon, who, in order to protect himself from the Curupari, took a young palm-leaf, plaited it, and formed it into a ring, which he hung on a branch in the track of the party.

THE American Museum of Natural History, New York, continues to make good progress with the preparation and study of the remarkable Dinosaurians discovered in the Upper Cretaceous fresh-water deposits of Alberta, Canada. In the latest *Bulletin* (vol. xxxv., art. 38) Mr. Barnum Brown describes perhaps the strangest of the Trachodonts, *Corythosaurus casuarius*, which is a reptile about 20 ft. long, shaped much like the familiar Wealden Iguanodon, but with a high, rounded, bony crest along the top of its head. One well-preserved skeleton is covered with remains of the skin, proving that it did not bear any bony armour. The whole body must have been invested with small epidermal tubercles, which are without any definite pattern over the sides, back, and tail, but are partly modified into rows of larger limpet-shaped tubercles over the ventral surface. If these herbivorous Dinosaurs had any marked external features, it is now clear that they must have been due to colour rather than to special developments of the skin itself.

PROF. S. W. WILLISTON, of the University of Chicago, continues his important researches on the osteology of American Permian reptiles, and has just published a useful synopsis of all the American Permo-Carboniferous Tetrapoda (Contributions from the Walker Museum, vol. i., No. 9). The various families are defined, and the diagnosis of each genus is accompanied by a statement as to the parts of the skeleton by which it is known. There is still much difficulty in defining and naming the higher groups, owing to the discovery of intermediate forms and the imperfection of the fossils on which the nomenclature was originally based. It becomes, indeed, continually more evident that the Permo-Carboniferous Tetrapoda are the generalised forerunners of several later groups which soon became very distinct. Prof. Williston's work is illustrated by numerous excellent figures, from which it is possible to realise how many of these strange ancestral land animals are now known by nearly complete skeletons.

THE Carnegie Institution of Washington has just published an important monograph of the Coal Measures Amphibia of North America, by Dr. Roy Lee Moodie (Publication No. 238). It is a most exhaustive work, sumptuously illustrated, and not only adds much to our knowledge, but also provides a synopsis which will form a useful basis for future researches on the rare fossils with which it deals. The technical and descriptive part of the monograph is preceded by a historical sketch, notes on the localities whence the fossils were obtained, and a general chapter on the anatomy of the group. Many forms were discovered by the late Sir J. William Dawson in decayed tree-stumps in the South Joggins coalfield, Nova Scotia, but the author remarks that no geologist appears to have collected in this locality during recent years. Other specimens in ironstone nodules from Mazon Creek, Illinois, are so beautifully preserved that the black pigment of the choroid can be seen in the orbit, and the course of the alimentary canal may be traced in the trunk, arranged almost exactly as in a modern salamander. The whole of the ossified skeleton is well known in many families, and dermal scales occur in several genera of the Branchiosauria and Microsauria. There is remarkable uniformity in the structure of all these early four-footed animals, notwithstanding the numerous variations in general outward shape and the relative proportions of parts. Some are even so much specialised as to have lost their limbs and become snake-like.

WHILE some animals exhibit wide powers of accommodation to their environment, and hence are numerically abundant, others display very limited responses in this regard, and hence are restricted in numbers. This is well illustrated by Miss Maud Haviland in *British Birds* for December, in the course of a brief but illuminating account of her observations on Temminck's stint, made during her stay at Golchika, on the estuary of the Yenisei. For miles along the river bank not a specimen would be seen, but it was abundant wherever running water and dwarf willow were found in association. Similarly, she found the little stint, *Tringa minuta*, breeding near running water only when this occurred in association with a sphagnum swamp. During the pairing season Temminck's stint gives utterance to a long-sustained trilling, which "is musical enough to deserve the name of song." It is "louder and less mechanical than the note of the grasshopper warbler, more musical than the whir of the fisherman's reel, and may be likened more truly to the croaking of many natterjack toads in chorus." This song is heard at its best when the bird hangs suspended some 40 ft. in the air, but it is also uttered while it is perched on a tree-trunk or on a block of ice. But on such occasions the trill is less perfect.

THE new part of the Proceedings of the Prehistoric Society of East Anglia (vol. ii., part ii.) contains several papers on flint implements illustrated in the usual effective manner, besides two important discussions of the wider problems of British late Tertiary geology. Mr. A. E. Peake, in a presidential address, returns to the subject of Grime's Graves, and after describing and figuring a considerable number of newly discovered implements from these old flint mines, reiterates his opinion that they are all of Palæolithic type. He thinks their date would never have been doubted had they not been associated with a mine and a recent fauna. Mr. W. J. Lewis Abbott, in a rather discursive paper, claims that both marine and fresh-water deposits of Pliocene age are much more widely distributed in south-east England than is commonly supposed to be the case. The late Mr. Charles Dawson's discovery of rolled remains of Pliocene mammals at Piltdown makes it especially desirable to re-examine all the superficial deposits in the Wealden area. Mr. A. S. Kennard contributes an important summary of the results of his long-continued researches in English Pleistocene geology. He concludes that there is no evidence of more than one glacial period, which occurred towards the close of the Pleistocene, and is represented near London by the Ponders End arctic bed. He is also of opinion that before the end of Pliocene times man was already in the Palæolithic stage of culture in this country.

THE recently published Bulletin of the Imperial Institute (vol. xiv., No. 3) contains a brief but highly interesting description of the new Udi-Okwogu coalfield of Southern Nigeria, which is now being energetically developed. It lies immediately to the east of the River Niger, and has been opened by means of a railway line running northwards from Port Harcourt, which has already reached the coalfield and is being continued. The coal is of Cretaceous age, and a number of seams, up to six in the Udi district, have been proved; four of these are considered workable, with thicknesses ranging from 2 ft. to 5 ft. 8 in. The coal is semi-bituminous, and contains a high proportion of volatile matter, averaging about 40 per cent. on the ash-free coal. The percentage of ash varies within very wide limits; in many of the samples it is between 4 and 8 per cent., but is very much higher in some of the others; the coal is everywhere of a non-coking character. The calorific power is, of course, variable, but not very high as a rule, most of the samples giving 6000 to 7000 calories. A certain amount of development work has already been done, the quantity produced up to the end of 1915 having been 7812 tons. It is unnecessary to point out that this discovery is of the highest economic importance, and will necessarily prove to be a factor of the utmost value in the industrial development of our West African Colonies.

AN informing lecture on the subject of "The British Coal-Tar Colour Industry and its Difficulties in Time of War" was delivered at the Society of Arts on December 8 by Mr. C. M. Whittaker, head of the experimental dye-house of British Dyes, Limited. The lecturer replied to the criticism directed at British dye-producers for not assisting dye-users with pattern cards and expert advice in dye practice by referring to the manual of dyeing issued in five languages so far back as 1906 by Messrs. Read Holliday and Sons, Ltd. He also pointed out the difficulty of producing dyes of well-known constitution owing to the circumstance that the primary coal-tar products essential in this manufacture are required for the production of high explosives. In war-time the first duty of the coal-tar industry is to furnish the munitions of war, after which the next important task is the production of colours needed for the military and naval equipments of the British, Colonial, and Allied Governments. That these requirements have been satisfied is a great achievement, which should be remembered by the private dye-users, whose demands necessarily take a third place. The lecture deals with other shortages of raw materials, and shows how very promising has been the progress of the British dye industry in spite of these numerous handicaps. Notwithstanding all these adverse circumstances, the shares of leading colour-consuming companies in this country have appreciated considerably during the war, and the dyeing trade has never been so prosperous. Continued progress depends on the highly trained chemist, and research is now being organised on a scale never before attempted in Great Britain. One of the first-fruits of this endeavour is the production of chloranthrene-blue, made by British Dyes, Limited. In the discussion, the chairman, Sir William Tilden, referred to the encouraging outlook to be derived from the lecture. In replying to various questions the lecturer stated that bromine was the only product for which we should have to depend on Germany. The dye-makers had now mended their ways in regard to teaching institutions, and the grant of 5000*l.* for dye research by British Dyes, Limited, to the Huddersfield Technical College was a practical proof of this. As regards khaki dyes, the British productions were equal in fastness to any dyes made abroad.

IN 1913 the Rubber Research Committee in Ceylon, in co-operation with the Department of Agriculture in the Colony, started a scheme of research work, to be carried out partly on plantations in the island and partly at the Imperial Institute in London. The work in Ceylon includes the preparation of rubber in various ways and under different conditions, with the view of ascertaining the effect of the several factors on the quality of the rubber. The samples so prepared are sent to the Imperial Institute, where they are chemically examined, vulcanised, and their mechanical properties determined. Some results of this work are described in Bulletins 23 and 24, issued recently by the Department of Agriculture in Ceylon, which contains a number of interim reports from the Imperial Institute. It appears from these reports that as regards tensile stress required to rupture and elongation at the point of rupture, well-prepared Ceylon plantation rubber is in no way inferior to "fine hard Para" rubber from Brazil. The variability in properties of plantation rubber of which manufacturers have complained appears to be limited to the "time of vulcanisation," which, according to these reports, may vary within wide enough limits to cause trouble in the smooth working of a factory. The cause of this variation is being systematically sought by a careful study of the effects of various coagulants, "improvers," mechanical treatment, etc., employed in the process of preparation, on the working quality of the rubber, and especially on its "time of vulcanisation." Attention is also being given in Ceylon to the experimental tapping of Hevea trees. In Bulletin No. 25 Mr. Petch gives a further instalment of the results of this work, which has been in progress since 1912, and is designed to ascertain the difference in yield and the final effect on the trees of methods of tapping, which differ in the time interval allowed for resting the trees and in the spacing adopted between the tapping cuts. The results already obtained are of considerable interest, but do not permit of final conclusions being drawn.

THE practical value of the storm warnings issued by the Meteorological Department at Calcutta has twice been illustrated within the past two months, says the *Pioneer Mail* of December 2 last. Madras had due notice of the approach of the gale which visited it on November 29, the "Great Danger" signal having been hoisted a considerable time before the arrival of the storm. Similarly the hoisting of the "Great Danger" signal warned Calcutta of the approach of the storm of September 21, and the Committee of the Bengal Chamber of Commerce has publicly expressed its appreciation of the "usefulness and efficiency" of the work of the Meteorological Department on that occasion. "The warnings," it states, "were communicated to the public in good time before the storm actually broke, and proper precautions were consequently taken. The result was that the casualties to shipping were confined to a few launches and boats, no large vessels being sunk or damaged."